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COMBINED WRITING INSTRUMENT AND DIGITAL DOCUMENTOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 09/071,086 filed May 1, 1998 which is a continuation in part of 08/636,126, filed Apr. 22, 1996 now abandoned.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

BACKGROUND OF THE INVENTION

This invention relates generally to computer equipment and, more particularly, to a device that functions as a hand-held writing instrument and as a generator of digital copies of whatever is written.

Word processing by keystroke entry is a relatively slow process. Moreover, with the development of the wireless internet made possible by digital cell phone technology, there exists a need for the creation of digital documents such as e-mail while the sender is mobile. In such a mobile environment, dependence on keystroke entry of data requires the use of miniature keyboards that are very tedious to use. Although voice recognition technology could be used as an alternative upload, it remains relatively slow as well and it suffers from requirement for seclusion in order to avoid extraneous noise and in order to ensure privacy. By contrast, handwriting often is the fastest and most convenient way to prepare documents. In some applications, such as medical records, it is the only practical data entry and data storage means available. This has retarded the ability of healthcare to take full advantage of the internet because it has made the creation of an electronic medical record a redundant task. That is the healthcare provider must write in the chart then either enter data via keystroke or dictate the document and use voice-recognition software or a transcriptionist to convert the information into a digital document. Of course, conventional pen on paper handwriting has significant drawbacks. However, there is computer software available that converts handwriting to typeface and further support writing by hand in the production of documents. Nevertheless, limitations imposed by the hardware required for such pen-based digital document applications have restricted the use and growth of pen-based digital documents to date. Pen-based digital document production heretofore has consisted of grid-type computers with stylus-type writing instruments. Pressure from the stylus on a pressure-sensitive computer screen is used to create a digital copy of the written material. Handwriting software recognition programs can be used to convert the script to printed text. Another approach uses a radio frequency (RF) generator incorporated into a writing pen in conjunction with a special pad containing an array of RF signal receptors in order to track the position of the pen tip in the document. This information is used to create a digital copy of the written document. An example of this technology is the system sold by A. T. Cross under the trademark "I Pen". These types of systems are inconvenient, however, because they necessitate access to the special screen or pad. That is, the writing instrument is limited to its application within the system and cannot be used independently of the special screen or pad to create the digital document. Attempts to create writing instruments that could make digital copies of the written

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document independent of a special writing pad or screen include the use of a special paper with a subtle pattern on it for recognition by a sensing means, the Anoto system (Ericsson Manufacturing, Sweden). This is impractical because it requires that every document be prepared on this special paper. The pad, grid and special paper technologies represent a means of sensing and tracking position of the writing device in a document. Others have attempted to create a digital record of the written document by using specially modified writing instruments that do not require special screens, pads, or paper. Whereas the latter approaches all use a position-sensing means to create the digital record, these alternate approaches use motion-detection means of the writing instrument alone to create a digital copy of the written document. The advantage of using such motion-sensing means is that it allows the use of the device on any ordinary writing surface. For example, in 1964, Armbruster (U.S. Pat. No. 3,376,551) described a magnetic writing device wherein an ink pen mechanism included a rotating ball for the electromagnetic detection and quantification of movement by induction of an electric current. Thus, distance was not directly measured. The speed of ball rotation determined the amount of electric current induced which was proportional to the velocity. The output was variably to an electric typewriter or to a computer. After the introduction of the computer mouse in the 1980's, Masaki (U.S. Pat. No. 5,159,321) in 1992 taught the use of an ink pen mechanism including a rotating ball that would function as a mouse-like device for computer input. Unlike Armbruster, Masaki taught a spring-type of sensor mechanism for detection and quantification of movement of the rotating ball point wherein ink on the ball surface would cause displacement of two spring-loaded sensing devices at right angles yielding velocity data. In my co-pending application (U.S. patent application Ser. No. 09/071,086), I disclose a distantometer means to detect motion of the writing pen in order to create a digital copy of the written document. Others have taught the use of tiny microaccelerometers to create a digital copy of the written document (WO9922338).

These approaches that use a motion-sensing means give the user more freedom because they don't require a special writing surface like the position-sensing technologies. On the other hand, they have limitations such as the inability to edit a document because the position or location of the writing device in the digital copy is unknown. This also limits their usefulness for writing other than for continuous script or cursive. That is to say, such motion-sensing technologies must assume that the written data always belongs at the trailing end of the document. Thus printing, symbol drawing as for the Chinese language, mathematical formulas, picture drawing, table creation, and the like are all very difficult if not impossible with these motion-sensing technologies. This inability to identify position in a document is a severe disadvantage of writing devices that use a motion-sensing technology to create a digital copy of the written document.

The present invention shares the freedom of use of the motion-sensing technologies but overcomes the limitations of the prior art by using a position-sensing means. Moreover, unlike all prior position-sensing art, the position-sensing means of the present invention does not require a special writing surface.

SUMMARY OF THE INVENTION

It is among the principal objects of the present invention to provide a writing instrument that also can create a contemporaneous digital copy of the written document.